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ORBIT AND PRELIMINARY PERTURBATIONS OF THE MINOR  
PLANET (716) BERKELEY.  
(ABSTRACT OF THESIS)

The asteroid (716) Berkeley was discovered July 30, 1911, by Palisa of Vienna and named "Berkeley" by him for the Students' Observatory of the University of California. The earliest determinations of its orbit revealed a mean motion very nearly commensurable with that of *Jupiter* in the ratio two to five. It therefore belongs to the class of minor planets which Brendel has designated as critical in so far as the mathematical theory of perturbations is concerned.

The planet offers an unusually interesting and fruitful problem in the theory of perturbations, since Hansen's method cannot be applied. The group theory as developed by Professor Bohlin of Stockholm was chosen as the basis for the development of the perturbations. During the development of the work, several important questions arose concerning the applicability of the Bohlin method when almost exact commensurability takes place.

In critical cases of this sort the success of the investigation depends very largely on the accuracy of the underlying osculating orbit.

The final test of any orbit is its representation of the observations. The writer investigated from that standpoint the various orbits of this asteroid which have been published, and compared their representations of the observations with those of several orbits computed by him by Leuschner's Short Method. It was found that the writer's orbit represented observations extending over a period of eight years better than those hitherto published.

Even on the basis of this osculating orbit, the most accurate obtainable, the final values of the constants of integration can be derived only after additional observations shall have been secured. For this reason, the perturbations derived by the writer have been termed "preliminary."

F. J. NEUBAUER.

NOTE ON COMET *b* 1916 (WOLF).

The first elements of the orbit of this comet, computed from observations of April 24, May 10, and May 23, 1916, and published in Lick Observatory Bulletin No. 282, represented the observations so well that it was not necessary to compute a

second set of elements until April of this year. The first ephemeris was given to 1916 August 29. \* A second ephemeris running from 1916 November 29 to 1917 March 5 was published in *Lick Observatory Bulletin* No. 286. It was from this ephemeris that the comet was picked up after passing conjunction by Gallo in Mexico December 23, and by Barnard December 31. The former observation was not an accurate position. The representation of Barnard's observation was  $(O-C, \Delta\alpha = -0''.9; \Delta\delta = +8'')$ .

The ephemeris continued to hold so well that it was extended to June 1 in *Lick Observatory Bulletin* No. 289. By April 21 the ephemeris was off 10" in right ascension and 6" in declination, and was running off further at the rate of 2" per month, so that a second orbit seemed desirable at this time.

Using Barnard's observations of 1916 April 24, December 31, and 1917 April 21 a second orbit was computed. This orbit together with an ephemeris extending from 1917 May 29 to 1917 December 31 has been issued as *Lick Observatory Bulletin* No. 295.

These second elements differ but very little from the first set. The perihelion passage time is changed 0.05 of a day. The perihelion distance is made slightly greater. The ephemeris shows that the comet will make its nearest approach to the Earth August 21, at which time it will be but very little less than unit distance from us. It will be in favorable position for observation throughout the year, coming to opposition September 17.

The comet will attain theoretical maximum brilliancy the first week of August at which time it will be 2.7 brighter than when Professor Barnard observed it on April 21. As the comet is now of only the 12th magnitude it is quite improbable that it will become visible to the unaided eye, as was hoped at one time. At maximum brilliancy it will be 118 times brighter than it was May 10, 1916.

Dr. Dinsmore Alter assisted in these computations.

R. T. CRAWFORD.

Berkeley Astronomical Department,

May 22, 1917.

Mr. R. F. Sanford, for many years connected with the work of the Lick Observatory both at Mount Hamilton and at Santiago, Chile, and during the current year a Fellow in the Lick Observatory, has recently received the degree of Doctor of Philosophy

from the University of California. His thesis was "On Some Relations of the Spiral Nebulae to the Milky Way."

Mr. F. J. Neubauer, a postgraduate student and Teaching Fellow in the Students' Observatory in recent years, and at present a Fellow in the Lick Observatory, received the degree of Doctor of Philosophy from the University of California at the last Commencement. His thesis is entitled "Orbit and Preliminary Perturbations of the Minor Planet (716) Berkeley."

Both theses will appear in the near future as Lick Observatory Bulletins.

W. W. CAMPBELL.

### GENERAL NOTES

Lick Observatory recently had the pleasure of a visit from Dr. Swasey and Dr. Brashear, returning from a tour in China. They made a visit of inspection to the new Victoria Observatory on their outbound trip. We understand that all the mechanical portions of the Victoria 72-inch telescope are completed and have given perfect satisfaction, and that only some of the minor optical parts still await completion.

The tests which Dr. Evershed has been making of the suitability of a site at Srinagar, Kashmir, India, for solar work, were continued thru most of 1916. It is found that good and frequently superlative observing conditions for solar work are the rule thruout the summer months. The two principal factors which it is believed conduce to the good definition are the absence of disturbing winds excluded by the surrounding wall of high mountains, and the very large areas of wet cultivation which in summer greatly reduce the heating effect of the Sun on the soil.

Dr. Stratton, Assistant Director of Cambridge Observatory, has been with the British forces in France since July, 1915. In April, 1916, he was gazetted Major in the Royal Engineers, has been twice mentioned in Sir Douglas Haig's despatches, and was awarded the D. S. O. on January 1, 1917.

In the Report of Greenwich Observatory we note that three of the junior assistants and nineteen computers are absent on military service. Mr. Jones is lent to the Inspection Department of the Woolwich Arsenal, and Mr. Edney to the Hydrographic Office.